

**What is claimed is:**

1       1. A method of preventing peeling between two silicon  
2 layers, comprising the steps of:

3       providing a first layer having a first silicon material;  
4       performing a hydrogen treatment on the first layer; and  
5       forming a second layer having a second silicon material  
6       on the first layer.

1       2. The method according to claim 1, wherein the first  
2 silicon material is amorphous silicon or crystalline silicon.

1       3. The method according to claim 1, wherein the second  
2 silicon material is amorphous silicon or crystalline silicon.

1       4. The method according to claim 1, wherein the hydrogen  
2 treatment is a hydrogen plasma treatment.

1       5. The method according to claim 4, wherein operational  
2 conditions of the hydrogen plasma treatment comprise an RF power  
3 of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating  
4 temperature of 300~400°C, an operating time of 30~90sec and an  
5 operating pressure of 0.1~10torr.

1       6. The method according to claim 5, wherein the  
2 operational conditions of the hydrogen plasma treatment comprise  
3 an RF power of 200Watts, a hydrogen gas flow of 600sccm, an  
4 operating temperature of 320°C, an operating time of 60sec and  
5 an operating pressure of 0.8torr.

1       7. The method according to claim 1, wherein the hydrogen  
2 plasma treatment is an HF vapor treatment.

1       8. The method according to claim 7, wherein the HF vapor  
2 uses HF (49wt%) with a ratio of H<sub>2</sub>O: HF= 30:1-70:1.

1       9. The method according to claim 4, wherein the hydrogen  
2 plasma treatment and the formation of the second layer are  
3 preformed in the same processing chamber.

1       10. A method of preventing peeling between two silicon  
2 layers in the microelectromechanical structure (MEMS) process,  
3 comprising the steps of:

4       providing a first layer having a first silicon material;  
5       performing a hydrogen treatment on the first layer to form  
6       an H-treated silicon surface with Si-H bonds thereon;  
7       and

8       forming a second layer having a second silicon material  
9       on the H-treated silicon surface.

1       11. The method according to claim 10, wherein the first  
2 silicon material is amorphous silicon or crystalline silicon.

1       12. The method according to claim 10, wherein the second  
2 silicon material is amorphous silicon or crystalline silicon.

1       13. The method according to claim 12, wherein the second  
2 layer is formed by CVD using SiH<sub>4</sub> as a reaction gas.

1       14. The method according to claim 10, wherein the hydrogen  
2 treatment is a hydrogen plasma treatment.

1       15. The method according to claim 14, wherein operational  
2 conditions of the hydrogen plasma treatment comprise an RF power  
3 of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating

4 temperature of 300~400°C, an operating time of 30~90sec and an  
5 operating pressure of 0.1~10torr.

1 16. The method according to claim 15, wherein the  
2 operational conditions of the hydrogen plasma treatment comprise  
3 an RF power of 200Watts, a hydrogen gas flow of 600sccm, an  
4 operating temperature of 320°C, an operating time of 60sec and  
5 an operating pressure of 0.8torr.

1 17. The method according to claim 10, wherein the hydrogen  
2 plasma treatment is an HF vapor treatment.

1 18. The method according to claim 17, wherein the HF vapor  
2 uses HF (49wt%) with a ratio of H<sub>2</sub>O: HF= 30:1~70:1.

1 19. The method according to claim 14, wherein the hydrogen  
2 plasma treatment and the formation of the second layer are  
3 preformed in the same processing chamber.

1 20. A method of forming a micromechanical structure,  
2 comprising the steps of:

3 providing at least one micromechanical structural layer  
4 above a substrate, the micromechanical structural  
5 layer being sustained between a lower sacrificial  
6 silicon layer having an H-treated surface and an upper  
7 sacrificial silicon layer; and  
8 removing the upper and lower sacrificial silicon layers;  
9 wherein the H-treated silicon surface increases interface  
10 adhesion between the lower and upper sacrificial  
11 silicon layers.

1        21. The method according to claim 20, wherein the lower  
2        sacrificial silicon layer is an amorphous silicon or crystalline  
3        silicon layer.

1        22. The method according to claim 20, wherein the upper  
2        sacrificial silicon layer is an amorphous silicon layer or a  
3        crystalline silicon layer.

1        23. The method according to claim 20, wherein the upper  
2        sacrificial silicon layer is formed by CVD using SiH<sub>4</sub> as a reaction  
3        gas.

1        24. The method according to claim 20, wherein the H-treated  
2        surface of the lower sacrificial silicon layer is performed by  
3        a hydrogen plasma treatment.

1        25. The method according to claim 24, wherein operational  
2        conditions of the hydrogen plasma treatment comprise an RF power  
3        of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating  
4        temperature of 300~400°C, an operating time of 30~90sec and an  
5        operating pressure of 0.1~10torr.

1        26. The method according to claim 25, wherein the  
2        operational conditions of the hydrogen plasma treatment comprise  
3        an RF power of 200Watts, a hydrogen gas flow of 600sccm, an  
4        operating temperature of 320°C, an operating time of 60sec and  
5        an operating pressure of 0.8torr.

1        27. The method according to claim 20, wherein the H-treated  
2        surface of the lower sacrificial layer is performed by an HF  
3        vapor treatment.

1           28. The method according to claim 27, wherein the HF vapor  
2   uses HF (49wt%) with a ratio of H<sub>2</sub>O: HF= 30:1~70:1.

1           29. The method according to claim 20, wherein the H-treated  
2   surface has Si-H bonds.

1           30. A method of forming a micromirror structure,  
2   comprising the steps of:

3           forming a first sacrificial silicon layer on a substrate;  
4           forming a mirror plate on part of the first sacrificial  
5           silicon layer;

6           performing an inert gas sputtering on the mirror plate and  
7           the first sacrificial silicon layer;

8           performing a hydrogen treatment on the first sacrificial  
9           silicon layer to form an H-treated silicon surface  
10           thereon;

11           forming a second sacrificial silicon layer over the mirror  
12           plate and the first sacrificial silicon layer;

13           forming at least one hole penetrating the second sacrificial  
14           silicon layer, the mirror plate and the first  
15           sacrificial silicon layer;

16           filling a conductive material in the hole to define a mirror  
17           support structure attached to the mirror plate and  
18           the substrate; and

19           removing the first and second sacrificial layers to release  
20           the mirror plate.

1           31. The method according to claim 30, wherein the substrate  
2   is a glass or quartz substrate.

1       32. The method according to claim 30, wherein the first  
2       sacrificial silicon layer is an amorphous silicon layer or a  
3       crystalline silicon layer.

1       33. The method according to claim 30, wherein the second  
2       sacrificial silicon layer is an amorphous silicon layer or a  
3       crystalline silicon layer.

1       34. The method according to claim 30, wherein the second  
2       sacrificial silicon layer is formed by CVD using SiH<sub>4</sub> as a reaction  
3       gas.

1       35. The method according to claim 30, wherein the inert  
2       gas sputtering is argon sputtering.

1       36. The method according to claim 30, wherein the hydrogen  
2       treatment is a hydrogen plasma treatment.

1       37. The method according to claim 36, wherein operational  
2       conditions of the hydrogen plasma treatment comprise an RF power  
3       of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating  
4       temperature of 300~400°C, an operating time of 30~90sec and an  
5       operating pressure of 0.1~10torr.

1       38. The method according to claim 37, wherein the  
2       operational conditions of the hydrogen plasma treatment comprise  
3       an RF power of 200Watts, a hydrogen gas flow of 600sccm, an  
4       operating temperature of 320°C, an operating time of 60sec and  
5       an operating pressure of 0.8torr.

1       39. The method according to claim 36, wherein the hydrogen  
2       plasma treatment and the formation of the second layer are  
3       performed in the same processing chamber.

1       40. The method according to claim 30, wherein the hydrogen  
2       treatment is an HF vapor treatment.

1       41. The method according to claim 40, wherein the HF vapor  
2       uses HF (49wt%) with a ratio of H<sub>2</sub>O: HF= 30:1~70:1.

1       42. The method according to claim 30, wherein the mirror  
2       plate is an OMO (oxide-metal-oxide) layer.

1       43. The method according to claim 30, wherein the  
2       conductive material comprises at least one of W, Mo, Ti and Ta.

1       44. A method for forming a micromirror structure,  
2       comprising the steps of:

3           forming a first sacrificial silicon layer on a substrate;  
4           forming a mirror plate on part of the first sacrificial  
5           layer;

6           performing an inert gas sputtering on the mirror plate and  
7           the first sacrificial silicon layer;

8           performing a hydrogen treatment on the first sacrificial  
9           silicon layer to form an H-treated silicon surface  
10           thereon;

11          forming a second sacrificial silicon layer over the first  
12           sacrificial layer and the mirror plate;

13          partially etching the first and second sacrificial silicon  
14           layers to create an opening exposing a portion of  
15           the mirror plate and at least one hole exposing a  
16           portion of the substrate;

17       filling a conductive material in the opening and the hole  
18            to define a mirror support structure attached to the  
19            mirror plate and the substrate; and  
20       removing the first and second sacrificial silicon layers  
21            to release the mirror plate.

1       45. The method according to claim 44, wherein the substrate  
2       is a glass or quartz substrate.

1       46. The method according to claim 44, wherein the first  
2       sacrificial silicon layer is an amorphous silicon layer or a  
3       crystalline silicon layer.

1       47. The method according to claim 44, wherein the second  
2       sacrificial silicon layer is an amorphous silicon layer or a  
3       crystalline silicon layer.

1       48. The method according to claim 44, wherein the second  
2       sacrificial silicon layer is formed by CVD using SiH<sub>4</sub> as a reaction  
3       gas.

1       49. The method according to claim 44, wherein the inert  
2       gas sputtering is argon sputtering.

1       50. The method according to claim 44, wherein the hydrogen  
2       treatment is a hydrogen plasma treatment.

1       51. The method according to claim 50, wherein operational  
2       conditions of the hydrogen plasma treatment comprise an RF power  
3       of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating  
4       temperature of 300~400°C, an operating time of 30~90sec and an  
5       operating pressure of 0.1~10torr.

1       52. The method according to claim 51, wherein the  
2 operational conditions of the hydrogen plasma treatment comprise  
3 an RF power of 200Watts, a hydrogen gas flow of 600sccm, an  
4 operating temperature of 320°C, an operating time of 60sec and  
5 an operating pressure of 0.8torr.

1       53. The method according to claim 50, wherein the hydrogen  
2 plasma treatment and the formation of the second layer are  
3 preformed in the same processing chamber.

1       54. The method according to claim 44, wherein the hydrogen  
2 treatment is an HF vapor treatment.

1       55. The method according to claim 54, wherein the HF vapor  
2 uses HF (49wt%) with a ratio of H<sub>2</sub>O: HF= 30:1~70:1.

1       56. The method according to claim 44, wherein the mirror  
2 plate is an OMO (oxide-metal-oxide) layer.

1       57. The method according to claim 44, wherein the  
2 conductive material comprises at least one of W, Mo, Ti and Ta.